United States Department of Agriculture | Forest Service | Shasta-Trinity National Forests

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Subject: Biological Evaluation of Forest Pest Situations in Several Stands on Goosenest RD, Klamath NF (FPM Rept. N91-10)

To: Forest Supervisor, Klamath NF

On June 24, 1991, Dave Schultz and Sheri Smith, Entomologists, and I visited with Russ Kazmierczak, Heidi Perry, and Walt Bavarskas from the Goosenest Ranger District to examine several forest stands where tree injury was occurring and the causes were unknown or pest management input was required. We visited four areas: a red fir stand on the side of Goosenest Mountain; a mixed conifer stand in the Davis sale; a ponderosa pine stand near Tamarack Flat; and dead and dying incense-cedars near Lava Camp.

Goosenest Mountain

The area in question is on the northeast side of Goosenest Mountain (T. 45 N., R. ~~5 E.~~ 3W., section 20). The stand is comprised of a red fir overstory with red fir and a small amount of whitebark pine and mountain hemlock in the understory. There is little shrub or herbaceous vegetation on the site, with pinemat manzanita and grasses being the principal species. Overstory trees are large, with diameters of 24-36 inches and larger common. Some of the area is currently being managed for goshawk habitat.

The area has been undergoing a recent increase in tree mortality. In addition, small openings are getting larger as trees are either being windthrown or snapping off 20-40 feet above the ground. The trees that have recently broken did so when they were alive. Several of these trees had considerable heartrot caused by the Indian paint fungus, Echinodontium tinctorium. The windthrown trees generally lay in a south to north direction.

The area is currently being managed for wildlife habitat, including protection of habitat for goshawks. There are no plans for any vegetation manipulation in the area. The District was concerned about the increased mortality and windthrow and wanted input to determine if there was a spreading pest situation that might merit attention and action.

Red fir mortality has been occurring in pockets for many years (decades) in this stand. Although insects are involved in this mortality, the underlying causes include tree age and high stocking levels. The site also has considerable rock near the surface which may be limiting its productivity. The amount of mortality in the stands has increased recently because of the continuing drought situation. Higher levels of mortality can be expected to continue for at least 2 years following the return to normal or better precipitation. At this time,

there are no actions that could be taken that will lessen the amount of mortality. Following cessation of the drought, some reduction of stocking density could reduce future mortality, but it must be recognized that because of the age and decadence of this stand, mortality, windthrow, and stem breakage will continue. As openings are created and expand, natural regeneration of red fir will occur and occupy the openings.

The stem breakage of live trees is a result of the increased amount of heartrot in many of the trees and the openings that are being created from tree mortality. As trees die and the canopy opens, wind patterns can change in the stand. Trees that have been more dependent on their neighbors for support may become exposed to new forces for which they are not structurally prepared. This will result in breakage, usually during strong winter storms when higher wind forces occur from directions that were not normally experienced. Trees in and around existing openings can be expected to break in future years. This may provide some additional wildlife habitat and increase opening size, resulting in increased regeneration and growth of the regeneration.

Davis Sale

We visited a unit in the Davis sale (T. 44 N., R. 2 E., section 26) that was proposed as a clearcut regeneration unit. The current stand is comprised of ponderosa pine, lodgepole pine, and white fir. The stand has 2 to 3 layers with ponderosa pine or lodgepole pine making up the largest component of the upper layer depending on the specific site. A layer of predominants is scattered through the stand and contains ponderosa pine and white fir. The bottom layers have a mixture of these three species, but lodgepole pine and white fir are the largest component. The unit is situated in a drainage and up a slope with the amount of lodgepole pine increasing as you progress downslope into the drainage. Some of the white fir regeneration that is in the lower levels of the drainage and that is partly exposed is very dense and compacted as a result of repeated branch tip mortality from cold and frost. There is concern over the effect of creating an opening in an apparent cold air drainage on the future regeneration.

In addition to frost, three pests were observed in lodgepole pine. A small amount of dwarf mistletoe, Arceuthobium americanum, was seen in a lodgepole pine along the road. The level of infection was very low in the stand. Western gall rust, caused by Peridermium harknessii, was observed in a number of lodgepole pines, but did not appear to be causing significant damage. This disease causes branch galls and bole cankers on infected trees. Many of the larger lodgepole pines had stem cankers of stalactiform rust, caused by Peridermium stalactiforme. This was the most significant pest on lodgepole pine in this unit. In most situations, stalactiform rust does not kill a tree, but rather deforms it and reduces its timber value. On some occasions, it may cause a structural weakness that results in tops of trees breaking. Stalactiform rust infections alternate between lodgepole pine and Castilleja spp. The fungus must alternate between these two hosts for infections to continue. Stalactiform rust has been noted as causing pine seedling mortality, but this is not common.

The harvest prescription for this stand is to clearcut, tractor pile, and plant with ponderosa pine and possibly some lodgepole pine. It is recognized that both lodgepole pine and white fir will naturally seed in following site disturbance. The primary concerns for consideration in the future management of

this stand and the development of a silvicultural prescription include the topo-edaphic condition and the high level of stalactiform rust. The following management alternatives are presented to address these concerns.

1. No Action. The stand will remain undisturbed. Tree mortality in the overstory will continue and increase, especially during drought periods. Average annual mortality may increase to 1-2 trees per acre; however, this may be concentrated in groups in the stand and not be evenly distributed. Also, this is an average value calculated from large areas. Mortality values for any specific stand may be much greater during a particular year. Stalactiform rust will continue to infect small lodgepole pines, but will have limited effect on regeneration. Larger infected trees will not be significantly affected, although a few trees may break at the canker. The timber value of trees with large bole cankers will be reduced. The amount of white fir will increase in the upper layers of the stand as the understory slowly grows. Most of this will be on the upper slopes.

2. Partial Cut. The stand will be thinned to reduce the stocking level and to improve tree health and vigor. Many of the predominants should be removed to reduce competition with more vigorous, smaller trees. Some predominants could be retained for diversity and future snags, but stocking levels around these trees would need to be reduced. Ponderosa pine should be the favored species on the upper slopes because of the problem with stalactiform rust on lodgepole pine and the susceptibility of white fir to cold damage. On the lower slopes and in the drainage, lodgepole pine should be favored with a smaller proportion of ponderosa pine. When selecting leave trees, lodgepole pine with large stalactiform rust bole cankers should be removed if other leave tree options are available. Mortality levels should not increase and may decrease from current conditions. Although tree growth may not increase significantly, improved health and vigor can be expected.

3. Regeneration Harvest. The stand will be clearcut and planted as originally prescribed. Some of the planted ponderosa pine may be damaged by cold, especially in the drainage where cold air settles. Ponderosa pines in the bottom of the drainage may not grow as well because of increased water and possibly a higher water table. After removal of the existing stand, the water table may actually increase until sufficient vegetation returns and larger quantities of water are transpired. Any white fir that naturally regenerates will likely be affected by the cold and will be suppressed in growth, if it isn't killed. Natural lodgepole pine will eventually be infected by stalactiform rust and develop bole cankers. This will reduce their timber value, although these trees can be removed during precommercial and commercial thinnings.

Tamarack Flat Area

There was some tree mortality in a stand located near Tamarack Flat. The stand is predominantly ponderosa pine, with some white fir. Most of the trees are about 8 to 14 inches dbh. The stand was precommercially thinned in the past. The immediate cause of the ponderosa pine mortality was attacks of the mountain pine beetle, Dendroctonus ponderosae. Contributing factors to the pine mortality were relatively high stocking for an eastside pine stand, and several consecutive years of drought. White fir mortality was very high in proportion to the percentage of white fir in the stand. The dead white fir had numerous

attacks by the fir engraver, Scolytus ventralis. A few of the more open-grown white fir in the stand were 16 to 20 inches dbh. Most of the white fir growing under densely stocked conditions generally exhibited signs of slow growth or fir engraver attack before reaching a size of about 12 inches dbh.

Mortality of ponderosa pine and white fir is expected to decline after precipitation returns to favorable levels. If no action is taken, the basal area will slowly increase as the trees grow. Mortality will increase again at some point in the future, probably in conjunction with a soil moisture deficit. Mortality of white fir will always be disproportionately high on this drought-prone eastside pine site.

Dendroctonus bark beetles have extremely efficient aggregating pheromones. When these beetles are involved in mortality in a pine stand, they often cause the death of a group of trees. Leaving a pine stand unthinned can eventually result in portions of the stand being unstocked, or with stocking at levels much lower than the carrying capacity.

Thinning this type of stand to about 100 square feet of basal area should improve growth and vigor. This would reduce or hold mortality to acceptable levels for at least a decade. If leave trees are selected on the basis of the best crown condition, a small percentage of the white fir would be retained. If a larger percentage of white fir is needed to meet some other objective, it may be possible to meet this goal if the stand is managed on a shorter (60 to 80 year) rotation.

Lava Camp

Approximately four large incense-cedar trees died at about the same time in the Lava Camp area. The reason for concern about the mortality is that incense-cedar provides much of the biological diversity in the area. The trees were roughly 24 to 40 inches dbh. The external appearance of the trees indicated they were quite old. The other vegetation in the area, as well as an abundance of lava and obsidian, indicate a droughty site. The trees were heavily infested by incense-cedar mistletoe, Phoradendron juniperinum ssp. libocedri. Although the trees evidently tolerated a high level of mistletoe infection for many years, the visual appearance of the crowns suggests that the combination of mistletoe, overmaturity, and five years of drought contributed to the death of the trees. The lower boles of the trees were infested with cedar borers. It was not possible to examine the tops of the large dead trees. Smaller dead incense-cedar in the general vicinity had infestations of cedar bark beetles, Phloeosinus sp., in the thin-barked portions of the stem and branches. All of the beetles which breed in dying cedar are essentially slash-breeding insects. They are not capable of killing healthy cedars unless they build up to large numbers in abundant, green cedar slash.

It appeared that the most susceptible incense-cedar trees in the area have aleady been killed. It is difficult to predict whether additional trees will die because there are very few external signs of infestation by these insects. Mortality is almost certain to decline as precipitation returns to more favorable conditions. There are no known actions which would reduce the mortality in the short term. A general reduction in biomass would probably increase the longterm vigor and extend the lifespan of some trees.

If you have any questions about this report or need additional assistance, please contact us at the Shasta-Trinity Supervisor's Office.

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